

### Claims

1.       Airbag manufacturing apparatus comprising a tube of film arranged to be fed to a sealing station which station, in use, is arranged to apply seals across the width of a tube to trap air in the tube between two spaced seals, the apparatus being characterised in that air is supplied to be trapped between two spaced seals through the tube, from an open end of the tube.
2.       Apparatus as claimed in claim 1 in which the tube is arranged to be supplied to the sealing station from a supply station.
3.       Apparatus as claimed in claim 2 in which the supply station is arranged to maintain a passage through the tube.
4.       Apparatus as claimed in any preceding claim in which the air that is arranged to be trapped between two spaced seals is arranged to pass through the interior wall of the tube with the tube having nothing in it along its bunched up length.
5.       Apparatus as claimed in claim 2, 3 or 4 in which the supply station includes a hollow member around which the tube is located.
6.       Apparatus as claimed in claim 5 in which air that is arranged to be trapped between two spaced seals is arranged to pass through the interior of the hollow member.

7. Apparatus as claimed in any preceding claim in which the air that is arranged to be trapped between two spaced seals is arranged to pass through the interior of the tube over the exposed interior wall of the tube.

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8. Apparatus as claimed in any preceding claim in which the tube is arranged to be bunched up.

9. Apparatus as claimed in claim 8 in which the tube  
10 is arranged to bunched up in the axial extent of the tube.

10. Apparatus as claimed in either of claims 8 or 9 in which, prior to any bags being made from the tube, the tube is bunched up to comprise the ratio of the length of  
15 the bunched up tube to the length of the tube when stretched out be more than 1:2.

11. Apparatus as claimed in any of claims 8 to 10 in which the bunched up tube is arranged to maintain an  
20 opening throughout its length.

12. Apparatus as claimed in claim 11 in which the bunched up tube is arranged to maintain an opening throughout its length by maintaining such an opening  
25 solely as a result of compression induced during bunching of the tube.

13. Apparatus as claimed in claim 2 or any claim when dependent upon claim 2 in which the supply station is  
30 removably mounted on the apparatus.

14. Apparatus as claimed in claim 13 in which a different supply station can be used when a previous supply station is no longer required.

5 15. Apparatus as claimed in claim 2 or any claim when dependent upon claim 2 in which, during mounting of the supply station, the supply station is arranged to partially engage with the apparatus and move in at least one axial direction with respect to the elongate axis of  
10 the tube.

16. Apparatus as claimed in claim 15 in which, during mounting of the supply station, the supply station is arranged to move in at least one axial direction against a  
15 resilient bias.

17. Apparatus as claimed in claim 2 or any claim when dependent upon claim 2 in which the supply station is arranged to be held in position by the apparatus when  
20 mounted thereon to prevent further movement of the supply station towards the sealing station.

18. Apparatus as claimed in claim 2 or any claim when dependent upon claim 2 in which the supply station is  
25 arranged to be supported from beneath that station.

19. Apparatus as claimed in any preceding claim in which the tube of film is arranged to pass over a spreader having a greater extent in the direction across the tube  
30 in the direction that a seal made by the other sealing station is arranged to make then in a direction transverse thereto.

20. Apparatus as claimed in claim 19 in which the spreader is hollow.

21. Apparatus as claimed in claim 20 in which the spreader is arranged to have air passed therethrough which air is the air that is arranged to be trapped between two spaced seals.

22. Apparatus as claimed in claim 19, 20 or 21 in which air is arranged to flow over at least one surface of the spreader when air is being supplied to the tube.

23. Apparatus as claimed in any of claims 19 to 22 in which the spreader is located downstream of the supply station.

24. Apparatus as claimed in any of claims 19 to 23 in which the spreader is fast with the supply station.

25. Apparatus as claimed in any of claims 19 to 24 in which the spreader is arranged to be held within the film by the film.

26. Apparatus as claimed in any preceding claim including the drive means arranged to supply film to the sealing station.

27. Apparatus as claimed in any preceding claim in which the film is arranged to be manually drawn through the sealing station.

28. Apparatus as claimed in any preceding claim which the sealing station is arranged to effect a seal when the tube is stationery.

5 29. Apparatus as claimed in any of claims 1 to 27 in which the sealing station is arranged to effect a seal when the tube is moving.

30. Apparatus as claimed in claim 28 or 29 in which  
10 the sealing station is arranged to apply heat to effect a seal and then hold the tube at the sealing station.

31. Apparatus as claimed in claim 30 in which the sealing station is arranged to apply heat to effect a seal  
15 and then hold the tube at the sealing station for a period of time, such as a predetermined period for example, whilst the temperature induced by the heat decreases.

32. Apparatus as claimed in any preceding claim in  
20 which the sealing station includes a seal actuator arranged to cause the film to be moved against the sealing means.

33. Apparatus as claimed in claim 32 in which the  
25 actuator is arranged to hold the film against sealing means.

34. Apparatus as claimed in claim 33 in which the actuator is arranged to cause the film to be held against  
30 the sealing member after the force effected by the actuator is no longer being applied.

35. Apparatus as claimed in claim 34 in which the actuator is arranged to cause the film to be held against the sealing means after the force effected by the actuator is no longer being applied by a linkage being caused to  
5 move over centre upon activation of the actuator.

36. Apparatus a claimed in any preceding claim including a release actuator arranged to release a hold on the film against the sealing means.

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37. Apparatus as claimed in claim 36 in which the release actuator is arranged to move a linkage that is over centre back over centre.

15 38. Apparatus as claimed in claim 36 or 37 when dependent upon any of claims 32 to 35 in which a seal actuator and a release actuator are arranged, upon actuation, to move in opposed directions.

20 39. Apparatus as claimed in any of claims 36 to 38 when dependent upon any of claims 32 to 35 in which the seal actuator and the release actuator are connected to a linkage.

25 40. Apparatus as claimed in claim 39 in which the linkage is a pivotal linkage.

41. Apparatus as claimed in claim 39 or 40 in which the linkage includes a lost motion effect.

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42. Apparatus as claimed in any preceding claim in which the sealing station is manually actuatable.

43. Apparatus as claimed in any preceding claim in which the sealing station is automatically actuatable.

44. Apparatus as claimed in any preceding claim in which the seating station is arranged to form a pair of adjacent seals.

45. Apparatus as claimed in claim 44 in which the sealing station is arranged to effect the weakening of the tube between adjacent seal when effecting a sealing operation.

46. Apparatus as claimed in any preceding claim in which the frequency of the operation of the sealing station is adjustable.

47. Apparatus as claimed in any preceding claim in which the rate of feed of the tube past the sealing station is adjustable.

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48. Apparatus as claimed in any preceding claim in which the air that is arranged to be trapped between two spaced seals of the tube is supplied by a fan.

49. Apparatus as claimed in claim 48 in which the air that is arranged to be trapped between two spaced seals of the tube is arranged to be supplied to the upstream end of the tube.

50. Apparatus as claimed in claim 49 in which the air is arranged to be supplied to the upstream end of the tube through an opening in a container of the film.

51. A method of forming bags containing air comprising supplying air to a tube from which the bags are formed from one end of the tube, through the tube, and past a sealing station and effecting a seal across the tube by the sealing station.

52. A method as claimed in claim 51 comprising supplying air through the tube in flow communication with the interior wall of the tube.

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53. A method as claimed in claim 51 or 52 comprising passing air through the tube with the tube having been bunched up.

15 54. A method as claimed in claim 53 in which the tube has been bunched up such that the tube maintains a clear opening through the tube under its natural flexure.

55. A method as claimed in claim 53 or 54 comprising drawing film off a bunched up supply of film and moving that film to the sealing station.

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56. A method as claimed in claims 51 to 55 comprising replacing a supply of film by supplying a container housing a tube.

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57. A method as claimed in claim 56 comprising lowering a container down onto an upwardly facing support.

30 58. A method as claimed in any of claims 51 to 57 comprising passing the tube over a spreader when loading the machine with the tube.



59. A method as claimed in any of claims 51 to 58 comprising passing air around a spreader when supplying air to a tube.

5 60. A method as claimed in any of claims 51 to 59 comprising supporting a spreader with the tube.

61. A method as claimed in any of claims 51 to 60 comprising supporting the tube without a moment force  
10 having to be exerted on the supply of film.

62. A method as claimed in any of claims 51 to 61 comprising pulling bags off the machine from a location downstream of the sealing station.

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63. A method as claimed in any of claims 51 to 62 comprising the air being supplied through the tube urging the tube past the supply station.

20 64. A method as claimed in any of claims 51 to 63 comprising varying the length of the bag by varying the length of the tube between seals.

65. A method as claimed in any of claims 51 to 64  
25 comprising varying the amount of air in a given length of bag.

66. A method as claimed in any of claims 51 to 65 comprising a packer making a bag of a first length having  
30 a first volume of air and subsequently making a bag of the first length having a second volume of air.

67. A method as claimed in any of claims 51 to 66 comprising a packer making a bag of a first length having a first volume of air and subsequently making a bag of a second length having a third volume of air.

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68. A method as claimed in claim 67 in which the third volume of air is the same volume of air as the previous bag having a first length.

10 69. A method of making a bag as claimed in any of claims 51 to 68 when using apparatus as claimed in any of claims 1 to 50.

70. A cartridge arranged, in use, to be made into air  
15 bags comprising an elongate tube from which air bags are to be made the tube including a passage throughout the length thereof through which, in use, air is arranged to pass in order to comprise the air in the air bags.

20 71. A cartridge as claimed in claim 70 in which the passage is arranged to be open even when air is not passing through the film.

72. A cartridge as claimed in claim 70 in which the  
25 tube has been bunched up along its elongate axis such that the length of the bunched up film is less than the length of the extended film.

73. A cartridge as claimed in claim 71 and 72 in which  
30 the passage is arranged to be open through the natural role flexure of the bunched up film.

74. A cartridge as claimed in any of claims 70 to 73 including a container within which the film is located.

75. A cartridge as claimed in claim 74 in which the  
5 film is detached from the container around the side of the film.

76. A cartridge as claimed in claim 74 or 75 in which  
the film is detached from at least one end of the  
10 container.

77. A cartridge as claimed in any of claims 70 to 76 including an elongate member extending through the tube through which member air is arranged to flow.

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78. A cartridge as claimed in claim 77 in which the elongate member comprises a carrier.

79. A cartridge as claimed in any of claims 70 to 78  
20 when used in a method as claimed in any of claims 51 to 69 or when used in apparatus as claimed in any of claims 1 to 50.

80. A method of bunching a supply of hollow tube to be  
25 made into air bags comprising causing relative movement of a core and the tube such that part of the tube surrounds the core and then causing the tube to be reduced in its elongate extent to cause more tube to surround the core.

30 81. A method as claimed in claim 80 comprising loading the tube with the tube having a greater internal cross-sectional area than the exterior cross-section of the core.

82. A method as claimed in claim 80 or 81 comprising driving the tube onto the core.

83. A method as claimed in claim 82 comprising driving  
5 the tube onto the core by a friction drive.

84. A method as claimed in claim 82 or claim 83 comprising driving the tube onto the core with a first drive causing tube to move in a first direction along the  
10 core and a second drive that moves the relative location at which the first drive acts in a second direction.

85. A method as claimed in claim 84 in which the first and second drives act at the same time.  
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86. A method as claimed in any of claims 80 to 81 comprising removing the bunched up tube from the core.

87. A method as claimed in claim 86 comprising  
20 removing the bunched up tube from the core prior to making air bags from the tube.

88. A method of bunching a supply of hollow film as claimed in any of claims 78 to 84 comprising using the  
25 bunched hollow film in a film cartridge as claimed in any of claims 69 to 77 or when used in a method as claimed in any of claims 50 to 67 or when used in an apparatus as claimed in any of claims 1 to 49.